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MEMORANDUM

To: Bonnie Lavelle, Chris Weis

From: Mary Goldade, Bill Brattin

Date: November 17, 1999

RE: Vasquez Boulevard and I-70 Site
Sampling and Analysis Plan for Schools and Parks

cc: Project files

This memorandum serves as the Sampling and Analysis Plan for the schools and parks sampling portion of the VBI70 Phase III Field Investigation. The Data Entry SOP is currently not provided here, but will be submitted when available. Please feel free to contact me at (303) 292-4142 if there are any issues or points that require additional discussion.

R:\Vasquez & I-70\Project Plans\Phase III\Schools and Parks\schools & parksSAP-draft.wpd

Contract No.: N00174-99-D-003
Delivery Order No.: 0002
Purchase Request No.: 9203.3858
EPA IAG No.: DW17953800-01-0

1.0 BACKGROUND AND STUDY OBJECTIVES

This document presents the sampling and analysis plan for the schools and parks sampling component of the Phase III Field Investigation at the Vasquez Boulevard and Interstate 70 (VBI70) site, located in Denver, Colorado. It is intended as an addendum to the Phase III Field Investigation Project Plan, prepared by the USEPA, Region 8 with technical assistance from ISSI Consulting Group, Inc. Detailed descriptions of all aspects of the field investigation are described in the Project Plan, while this document addresses only those components that are specific to the schools and parks sampling activities.

Although substantial data regarding the nature and extent of contamination have been collected at the site (USEPA 1998a, 1998b), additional data are required to support reliable risk assessment and remedial risk management decisions. These additional data will be collected during a set of field activities referred as the Project Plan for the VBI70 Phase III Field Investigation (USEPA 1999a). As stated in the project plan, surface soil samples will be collected from schools and parks that have not already been sampled as part of the Phase I or II investigations.

Students may be exposed to chemicals of potential concern (COPC) in surface soil by ingestion or inhalation of contaminated soil. Some of the schools and parks located within the site boundaries have been sampled as part of the Phase I or II investigations. However, data are not available for other schools and parks. Consequently, the objective of this component of the Phase III Field Investigation is to:

> ***Collect sufficient numbers of surface soil samples at schools or parks located within the study area to support reliable exposure and risk calculations at each location, including an evaluation of both short-term and long-term risks.***

1.1 Project Description

This objective will be accomplished by collection of soil samples during field work to be completed in the fall of 1999. This work will be performed by an USEPA contractor, with planning and oversight provided by the USEPA, Region 8, or a designated contractor (ISSI Consulting Group, Inc.). All work will be conducted in accord with the detailed specifications contained within this document.

2.0 DATA QUALITY OBJECTIVES AND STUDY DESIGN

Data Quality Objectives (DQOs) are statements that define the type, quality, quantity, purpose and use of data to be collected. The design of a study is closely tied to the data quality

objectives, which serve as the basis for important decisions regarding key design features such as the number and location of samples to be collected, the chemical analyses to be performed, etc.

USEPA has published a number of guidance documents on the DQO process (USEPA 1994, 1996, 1998c), and this sampling plan has been developed in accord with that guidance. In brief, the DQO process follows a seven-step procedure, as follows:

1. State the problem that the study is designed to address
2. Identify the decisions to be made with the data obtained
3. Identify the types of data inputs needed to make the decision
4. Define the bounds (in space and time) of the study
5. Define the decision rule which will be used to make decisions
6. Define the acceptable limits on decision errors
7. Optimize the design for obtaining data in an iterative fashion using information and DQOs identified in Steps 1-6

Following these seven steps helps ensure that the project plan is carefully thought out and that the data collected will provide sufficient information to support the key decisions which must be made. The following sections summarize the application of the DQO process to the design of the surface soil sampling at schools and parks.

2.1 Data Quality Objectives

Step 1. State the Problem

Residents, especially children, may be exposed to soil at schools and parks. Limited data suggest that contaminant levels are low (USEPA 1998a, 1998b). However, data from residential properties suggest that contamination exists in an unpredictable pattern, and that the location of a contaminated property cannot be identified based on data from other nearby properties. Therefore, additional data about contaminant levels in soils at schools and parks must be gathered.

Step 2. Decisions to Be Made

Each individual school or park property within the study area will be evaluated to determine whether the concentrations of contaminants are either a) acceptable, or b) unacceptable. These risk-based decisions will, in turn, form an important input to risk management decision-making at the site.

This model will also be used in evaluating schools and parks within the site boundaries. Thus, the basic problem is to develop a method for identifying all individual properties that have contaminant levels above a level of health concern, and to obtain data from these properties that will allow evaluation of the health risks from direct and indirect contact with the soil.

Step 3. Types of Input Needed

The information needed to make risk-based decisions at a school or park property is reliable data on the concentration values in soil at the property. The key statistic is the arithmetic mean concentration within that property. However, because the true mean concentration within a property cannot be derived with certainty from a limited set of samples from the property, USEPA specifies that the decision for most chemicals (including arsenic) will be based on the 95% upper confidence limit of the mean (95% UCL) (USEPA 1992a). This, in turn, requires information on the inter-sample variability, and on the shape of the distribution of grab samples from a property (e.g., normal, lognormal).

Step 4. Bounds of the Study

Spatial Bounds

All school or park properties within the site boundary that have not been sampled to date will be sampled during Phase III, if authorization for access is granted by the owner. It is estimated that there are approximately 13 such properties. School or park properties that have been sampled previously will not be re-sampled at this time, with one exception. Results of the Phase I and II field investigations reveal that one location (St. Charles Place Park) may have an arsenic " hot spot" (ISSI 1999a), so this park property will be re-sampled to confirm the original data and to characterize the nature and extent of any high arsenic or lead levels that are present. Table 1 summarizes the final list of schools and parks (total = 14) that will be sampled.

Temporal Bounds

All data will be collected during the fall of 1999. However, because concentration values in soil are unlikely to vary significantly over time, the precise time period when collection occurs is not important. Results will be applied to current and future exposure conditions.

Step 5. Decision Rule

Available data indicate that the basic unit of contamination is an individual property (USEPA 1999b). Therefore, each property will be evaluated on an individual basis. Conceptually, the

classification of a property is achieved by performing exposure and risk calculations in accord with standard approaches and method specified by USEPA. For convenience, this approach may be simplified by calculating the maximum concentration value that yields an acceptable risk, and identifying this value as the Risk-Based Concentration (RBC). Then, each property can be classified simply by comparing the appropriate site statistic to the RBC. For arsenic, the risk calculation is based on the 95% UCL for the property, so the classification is achieved by comparing the 95% upper confidence limit of the arithmetic mean (UCL) for the property to the RBC for arsenic. In the case of lead, the forward-going risk calculation is based on the arithmetic mean of lead concentrations within the property, so classification is achieved by comparing the arithmetic mean soil concentration of the grab samples to an appropriate site-specific Risk-Based Concentration (RBC) for lead.

The RBC for both arsenic and lead at schools and parks will be developed during the feasibility study for the site, after finalization of the human health risk assessment. The RBCs will be designed to protect an individual with Reasonable Maximum Exposure (RME), and will be calculated using all of the same exposure and toxicity values developed for evaluation of this scenario in the risk assessment. This will include use of all reliable site-specific data available, and may include both deterministic risk assessment approaches and/or probabilistic approaches, as needed to adequately characterize the variability and uncertainty in risk to humans at the site. That is, a range of potential RBCs may be developed, allowing for risk management judgement in selection of an appropriate decision criterion, in accord with the nine criteria described in the National Contingency Plan (40 Code of Federal Regulations [CFR] Part 300).

Step 6. Acceptable Limits on Decision Errors

The null hypothesis that will be tested is that arsenic and lead levels in a school or park property are of human health concern. Two types of decision error are possible when performing this comparison:

Type I Error:	Rejecting the null hypothesis when it really is true. That is, the property is declared to be acceptable when it actually is unacceptable.
Type II Error:	Accepting the null hypothesis when it actually is false. That is, declaring the property to be unacceptable when it actually is acceptable.

The limits on these two types of errors are risk management judgements that must be made on a site-specific basis However, in general, it is common that the probability of a Type I error is set

at 5% (alpha = 0.05), and the probability of a Type II error is set at about 20-30% (beta = 0.2-0.3). Limiting the Type I error rate to 5% is achieved by using the 95% UCL of the mean as the input for the risk calculation. The Type II error rate is a function of the number of samples collected (the more samples collected, the more accurately the mean may be estimated and the smaller the ratio of the UCL to the mean). Although the exact probability of a Type II error cannot be calculated without site-specific information on the mean and variance of samples within each property, a data set of 15-30 samples is considered to adequate to limit this error rate to an acceptable level (probably less than 20%).

2.2 Study Design

Based on the data quality objectives outlined above, the key design elements of the school and park sampling component of the Phase III project are summarized below.

Sample Number and Type

Because the number of schools and parks that require sampling is relatively low (14), the proposed sampling scheme outlined in the Phase III Field Investigation Project Plan (USEPA 1999a) has been modified slightly. Rather than collecting three overlapping 10-point composite samples on each property, 30 grab samples will be obtained. While collection of overlapping composites has the advantage of being consistent with Phase III residential soil sampling, the main reason this approach was used for Phase III was to limit the number of samples collected at each property because of the very large number of residential locations. Any residences identified as potentially unacceptable using the three-step test for arsenic or the single-step test for lead must be resampled. Because the number of schools and parks is much smaller than the number of residences, the grab sample approach is preferred because it will obtain data about spatial or regional contamination, and any additional re-sampling is very unlikely to be needed.

Sample Location

Grab samples will be collected from grassy or bare soil areas at each property. Locations having paved, gravel, or sandy surfaces will not be considered sampleable. The number of grab samples collected at a property will be dependent on the sampleable area available. For a total sampleable area greater than 1500 square feet, 30 grab samples will be collected. However, properties having a sampleable area less than or equal to about 1500 square feet, 15 grab samples will be collected.

Sample Preparation

Soil samples will be homogenized, oven-dried, then sieved to <2 mm in accord with the most recent version of SOP #MK-VBI70-05 (Appendix F of the Project Plan).

2.3 Analyte List and Methods

Analyte List

Available data are sufficient to establish that the contaminants of chief human health concern at this site are arsenic and lead. Other chemicals either are not of health concern, or contribute a risk much lower than that contributed by arsenic and lead (ISSI 1999b). Thus, the analyte list for all samples collected during this project are arsenic and lead.

Analytical Method and Detection Limits

Lead and arsenic will be measured in soil samples by X-ray flourescence (XRF) and confirmed by inductively coupled plasma (ICP). The project-required detection limits (MDLs and PQLs) required for each analytical methodology planned for this investigation are summarized in the Project Plan. Results will be reported on a dry-weight basis.

3.0 FIELD SAMPLING PLAN

This Field Sampling Plan (FSP) describes the methods and procedures required for implementation of field sampling activities planned as part of the schools and parks sampling portion of the VBI70 Phase III Field Investigation including: descriptions of the sampling locations; number of samples planned for collection; sample matrices; and methods for sample collection, handling and analysis. Procedures associated with obtaining property access, waste management and disposal, and health and safety are outlined in the Project Plan.

In general, the steps required for successful implementation of this FSP include:

- Obtain a list of eligible schools and park properties for sampling (Table 1)
- Obtain property access authorization
- Collect samples (e.g., surface soil grab samples)
- Submit samples under chain-of-custody for analysis
- Perform sample preparation steps
- Perform sample analysis

At each step where data are collected, data must be incorporated into the project database in an accurate and timely fashion in accord with procedures outlined in the Section 5.0 of the Project Plan. Specific data entry requirements are provided in the most recent version of SOP #ISSI-VBI70-05.

3.1 Property Access Agreements

As noted previously, all of the schools or parks that were not previously sampled are eligible as part of this design. Written authorization to sample the schools and parks must be granted by the property owner prior to sampling. The general process for obtaining and maintaining documentation on property access authorization is summarized in Section 3.2 of the Project Plan. Specific details for obtaining access agreements are provided in SOP #MK-VBI70-01 (Appendix F of the Project Plan).

3.2 Identification and Collection of Surficial Soils

3.2.1 Property Maps

Before collecting any samples, a site diagram of each school or park will be prepared. The total sampleable area for each site diagram will be calculated and the number of grab samples required for each property will be assigned. Copies of each site map prepared for this investigation are provided in Attachment 1. Maps for the Johnson Headstart Center and St. Charles Place Park are not available at this time, but will be prepared and submitted the USEPA RPM prior to sampling.

3.2.2 Sampling Method Requirements

All surface soil samples will be collected in accord with the Surface Soil Sampling at Schools and Parks SOP #ISSI-VBI70-12 (Attachment 2). In brief, grab samples will be collected at the sampleable area across each individual property. Each soil core will be placed into a separate container and labeled as described in SOP # ISSI-VBI70-12. All sampling personnel will be trained in this procedure prior to collection of any investigative samples in order to ensure replicable samples.

All sampling equipment must be decontaminated before it is used again. Tools used for collecting soil samples must be decontaminated. Decontamination procedures are described in Section 3.4.

3.3 Sample Handling and Custody Requirements

Samples must be kept under strict chain-of-custody at all times. Therefore, chain-of-custody forms will be prepared for every sample collected in the field immediately following collection of each sample. Sample handling and custody requirements are described in Section 3.9 of the Project Plan.

3.4 Decontamination Procedures

Decontamination is defined as physically removing inorganic contaminants and foreign material (e.g., dust, oil, detergent) or altering their chemical character to nonreactive/inert substances. Therefore, decontamination (decon) procedures must be rigorously followed to minimize the potential for cross-contamination of samples. All sampling devices and equipment (e.g., coring tools, shovels) that are planned for use to collect samples at more that one location must be decontaminated prior to reuse.

All decon procedures shall be performed at a designated decontamination area. This area should be chosen such that environmental factors (e.g., cross-winds, drafts, dust) are minimized. Decon procedures will be performed in accord with the Decontamination Procedures SOP #MK-VBI70-07 (Appendix F of the Project Plan).

3.5 Sample Preparation

After grab soil samples have been collected, they will be submitted under chain-of-custody for sample preparation. Sample preparation will be performed in accord with the most recent version of the Sample Preparation SOP #MK-VBI70-05 (Appendix F of the Project Plan). In brief, the samples will be well-mixed and then oven-dried at about 100°C. Following the drying step, samples will then be sieved and homogenized again.

3.6 QA/QC Samples

All QA/QC samples will be inserted at the appropriate frequency as outlined in Section 4.0 of the Project Plan with one exception. Field duplicates must be collected at a frequency of 5% of all investigative samples collected (1 field duplicate per 20 investigative samples).

3.7 Field Documentation

Each sampling team will maintain two forms of field documentation, a three-ring binder containing all field data sheets, and a bound field logbook. Information contained in the field

logbook includes the following:

- Sample date
- Sample team ID
- Names of sample team members in attendance
- Weather conditions
- Time sampling begun each day
- Time sampling concluded each day
- Any information that is not limited to a single residence (e.g., deviations to sampling protocols)
- Signature of data logger.

This logbook will be maintained daily during sampling activities. Refer to the Field Documentation SOP # MK-VBI70-03 (Appendix F in the Project Plan) for more details.

Each field team will also carry a three-ring binder that holds the VBI70 Soil Sample Data Sheets for Schools and Parks (see SOP # ISSI-VBI70-12). These binders will only contain the paperwork necessary to complete a single day of sampling. One data sheet will be completed for each property. Any deviations from standard protocols or notable events (e.g., rainy weather, etc.) should be entered in the section for "Notes". The field team leader will sign the form when sampling is complete and all data are entered onto the form. The field team will not proceed to the next residence until samples are stored in a cooler and paperwork is complete.

At the end of each day of sampling the field teams will return to the VBI70 Field Office to check-in samples, paperwork and unused sample labels. Samples will be locked and stored under chain-of-custody until they are forwarded for sample preparation and analysis.

3.8 Sample Identification

Every field and QC sample collected during this investigation will be identified with a unique sample identification number (sample ID) as described in the Sample Identification and Tracking SOP ISSI-VBI70-01 (Appendix F of the Project Plan).

3.9 Analytical Method Requirements

Arsenic and lead testing will be performed on all soil samples using XRF, providing the chosen XRF methodology can achieve the project-required detection limits. A method detection limit study for the chosen instrumentation and proficiency tests for all analysts who will work on the VBI70 Phase III project must be provided to USEPA before analysis of any field samples may

proceed (See Appendix G of the Project Plan). XRF analysis will be performed in accordance with the XRF Instrument Operation SOP #MK-VBI70-06.(Appendix F of the Project Plan).

Ten percent of all soil samples collected at the schools and parks must be submitted to a contract laboratory for confirmation analysis by USEPA Method 6010B.

4.0 QUALITY ASSURANCE PROJECT PLAN

The complete Quality Assurance Project Plan (QAPP) for the VBI70 Phase III Field Investigation has been prepared in accordance with USEPA guidance documents. Refer to the Project Plan QAPP for all the information necessary to implement this sampling program.

4.1 Field Quality Control Samples

One field QC sample has been added to the list outlined in the Project Plan QAPP. This is summarized below.

Field Duplicate: Field duplicate samples are co-located samples that are collected at the site by field sampling personnel. These samples are submitted blind to the field preparation technician and the field to test both the precision of the analysis and the precision of sample collection. Field duplicates will be collected at a frequency of 5% of all samples collected (1 field duplicate per 20 investigation samples collected). Acceptance criteria for field duplicates is described in Section 4.8.1 of the Project Plan.

4.2 Detection Limits

MDLs are defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the true value is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. The PQL is defined as 10 times the standard deviation determined from the MDL study (or often described as 3 times the MDL). A MDL study must be performed for each method utilized in the study in accord with guidance outlined in the 40 CFR Part 136, Appendix B. Results that are below the PQL, but above the MDL will be qualified with a 'B' flag and reported as estimated results.

5.0 REFERENCES

ISSI. 1999a. Proposed Sampling Design for Schools and Parks at the Vasquez Boulevard and I-70 Site. Memorandum to USEPA. November 4, 1999.

ISSI. 1999b. Selection of Chemicals of Potential Human Health Concern at the Vasquez Boulevard and I-70 Site. Memorandum to USEPA. June 18, 1999.

USEPA. 1986. SW-846. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. September 1986 and all revisions.

USEPA. 1994. Guidance for the Data Quality Objectives Process. Final. U.S. Environmental Protection Agency, Quality Assurance Management Staff. USEPA QA/G-4.

USEPA. 1996. Quality Management Plan for the U.S. Environmental Protection Agency, Region 8. Version 1.0. Denver, CO.

USEPA. 1998a. Final Sampling Activities Report for North Denver Residential Soils – Phase I. Prepared by URS Operating Services. June 1998.

USEPA. 1998b. Sampling Analysis Report – Phase II Sampling for Removal Site Assessment. Vasquez Boulevard/Interstate 70 Site. Prepared by URS Operating Services. September 21, 1998.

USEPA. 1998c. USEPA Requirements for Quality Assurance Project Plans for Environmental Data Operations. Draft Interim Final. U.S. Environmental Protection Agency, Quality Assurance Management Staff. USEPA QA/R-5.

USEPA. 1998d. EPA QA/G-9 Guidance for the Data Quality Assessment Process: Practical Methods for Data Analysis. EPA/600/R-96/084. January 1998.

USEPA. 1999a. Project Plan for the Vasquez Boulevard and I-70 Site Phase III Field Investigation. Prepared by ISSI Consulting Group, Inc. August 4, 1999.

USEPA. 1999b. Draft Report for the Vasquez Boulevard and I-70 Site Residential Risk-Based Sampling Stage I Investigation. Prepared by ISSI Consulting Group, Inc. April 1999.

Table 1. List of Schools and Parks to be Sampled during Phase III Activities

Category	Name	Maps Prepared[a]
School	Annunciation - Playground	X
	Annunciation	X
	Barth Hall	X
	Family Star Montessori - Playground	X
	Family Star Montessori - Empty Lot	X
	Family Star Montessori	X
	Garfield Montessori School	X
	Hallett Hall	X
	Johnson Headstart Center	
	Martin Luther Headstart Building	X
	New School Site (40th Ave. & Steele St.)	X
	Northeast Montessori Child Care	X
	Wyatt Edison School	X
Parks	St. Charles Place Park	

a - Schools for which location maps are provided in Attachment 1 are marked with an "X". Maps for the other schools or parks will be prepared by the USEPA contractor and submitted to the USEPA RPM at a later date.

Attachment 1

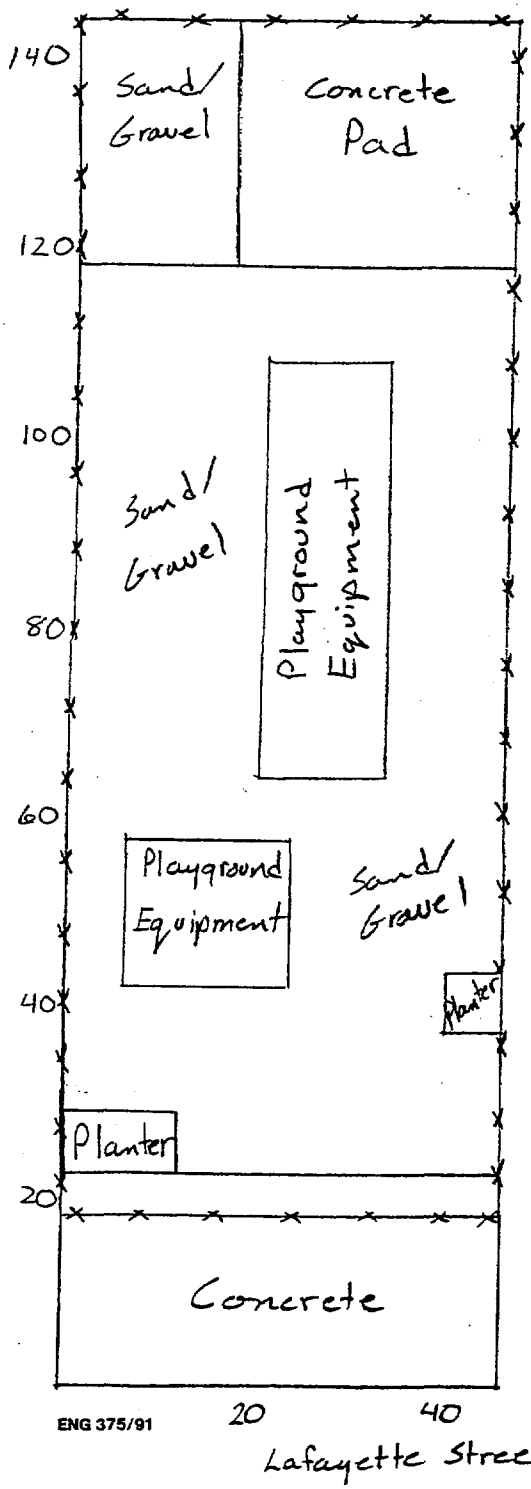
MORRISON KNUDSEN CORPORATION

Sheet 2 of 2

Project I-70/Vasquez Blvd. Contract No. 4994 File No. _____

Feature Annuciation Playground Designed KPA Date 11-2-99

Item _____ Checked _____ Date _____



NO USEABLE GROUND

Ø GRAB SAMPLES

ENG 375/91

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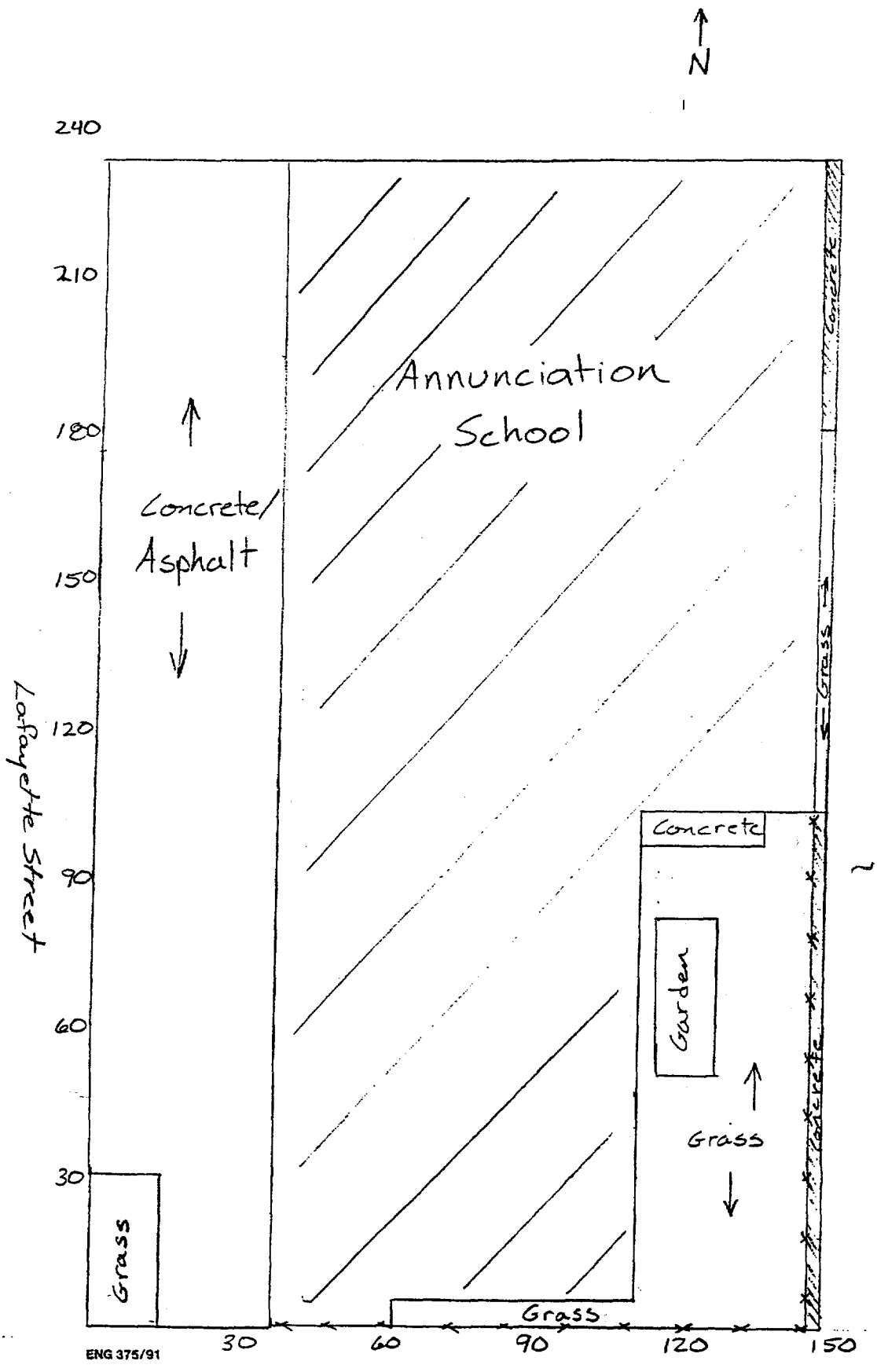
Sheet 1 of 2

Project I-70/Vasquez Blvd. Contract No. 4994 File No.

Feature Annuciation School-Lafayette St. Designed KPS Date 11-2-99

Item Checked Date



~4075 SQ FT

30 GRAB SAMPLES

ENG 375/91

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Sheet 3 of 4

Project I-70/Vasquez Blvd. Contract No. 4994 File No.

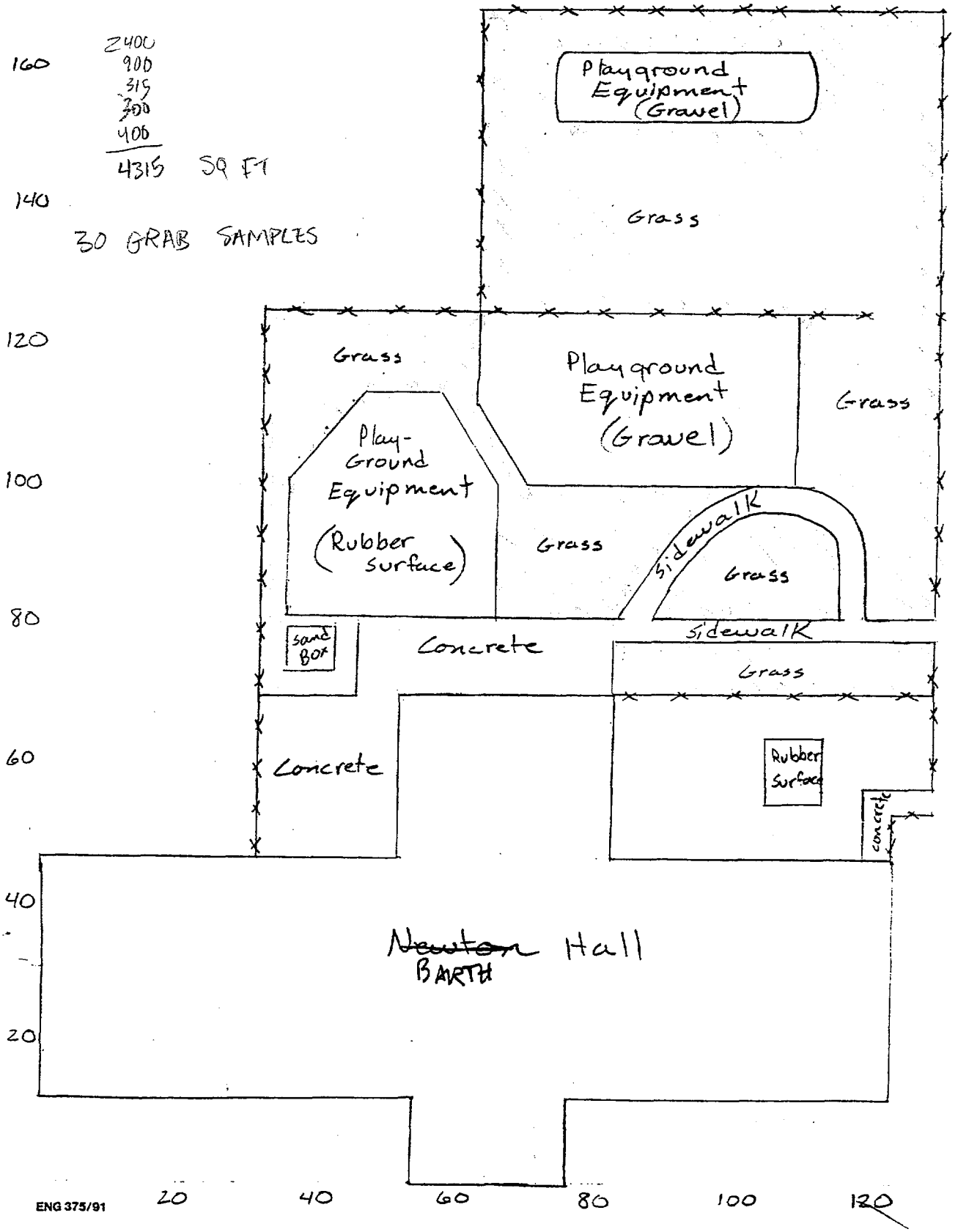
Feature ~~Newton~~ Hall BARTH Designed KPd Date 11-1-99

Item Checked Date

N →

2400
900
315
~~300~~
406
4315 SQ FT

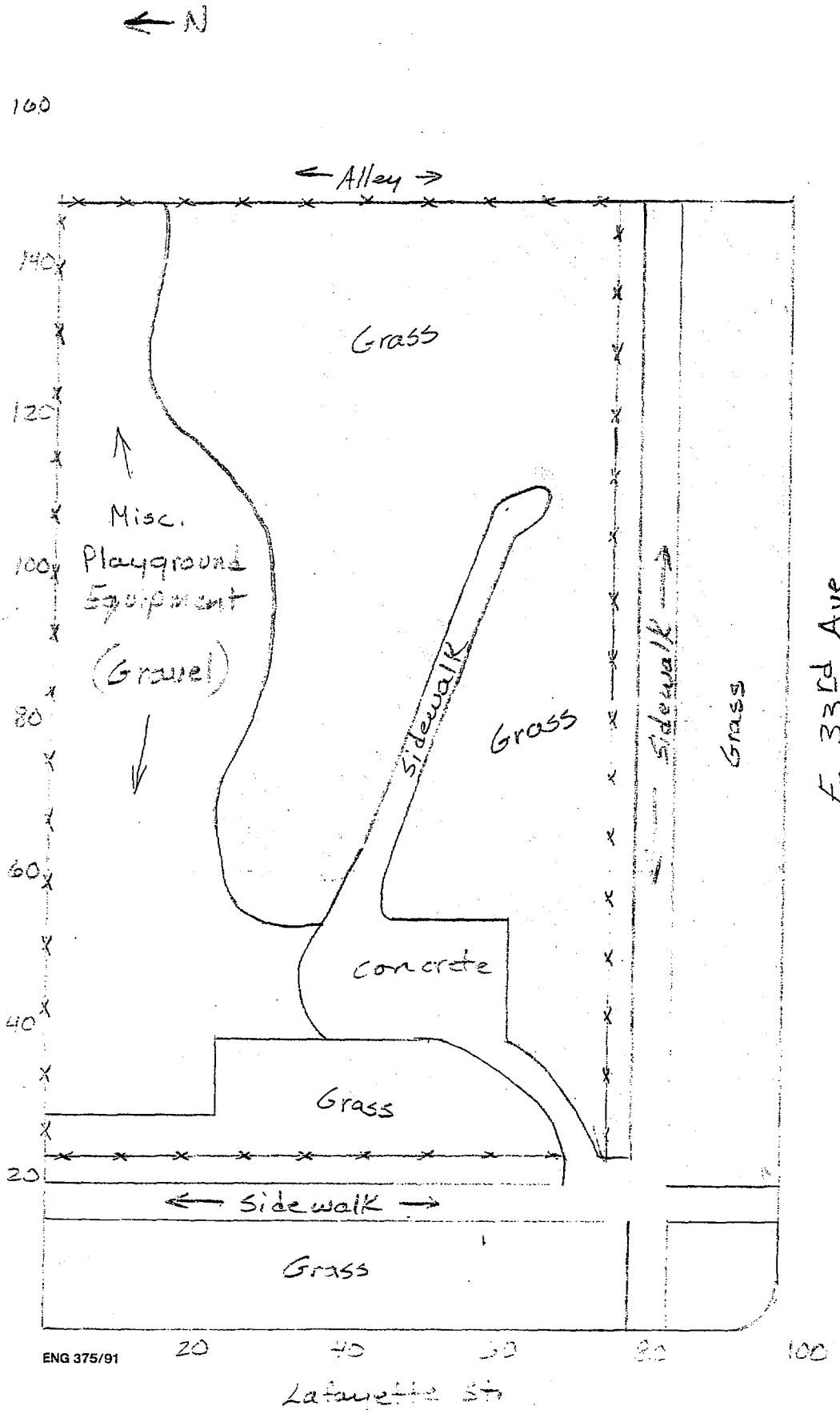
30 GRAB SAMPLES



ENG 375/91

MORRISON KNUDSEN CORPORATION

Project I-70 / Itaska - Blvd. Contract No. 4994 Sheet ____ File No. ____
Feature Playground - Family Star Homeward Designed KDL Date 11-3-99
Item ____ Checked ____ Date ____



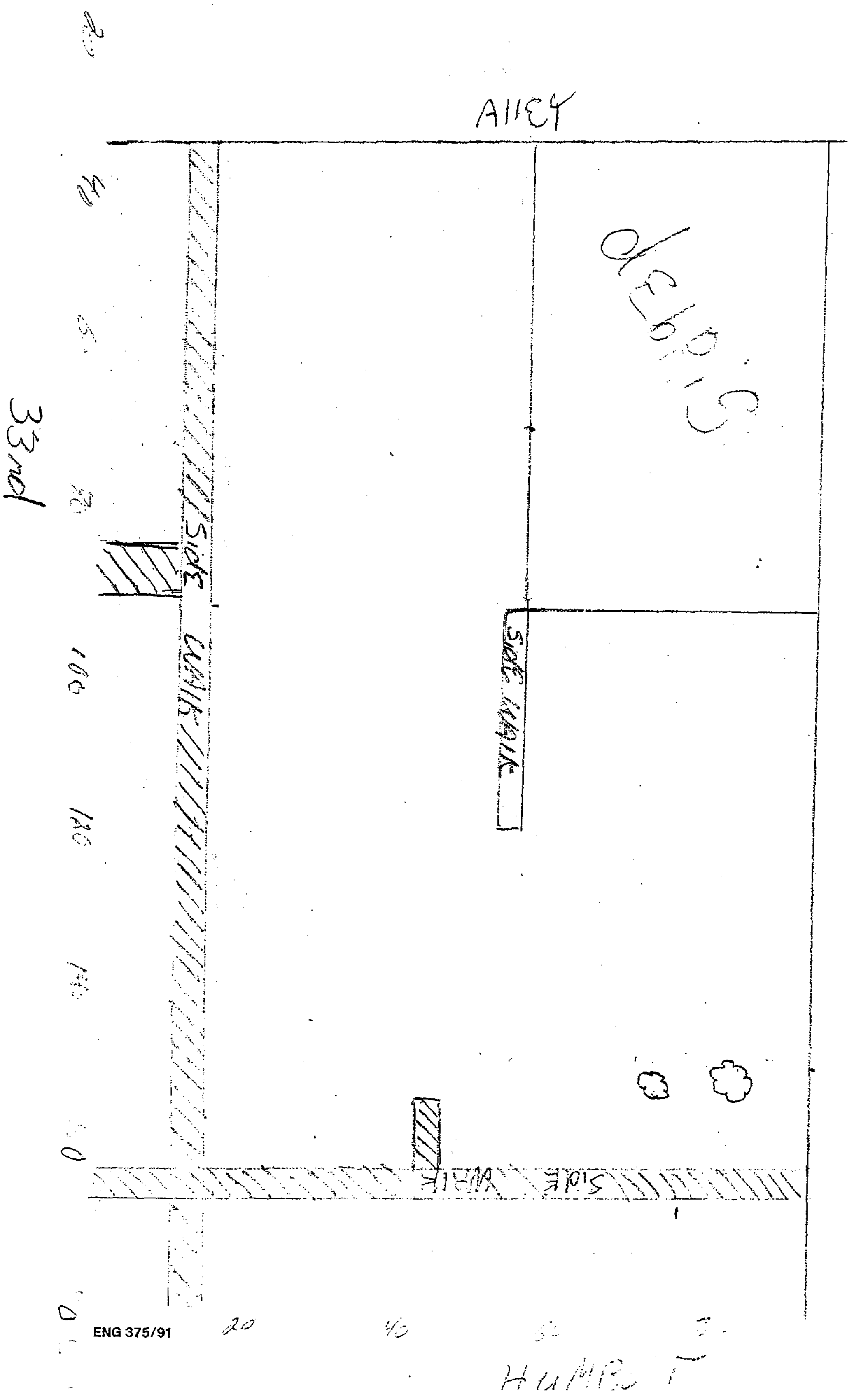
5700
2250
225
1125
900
10200 SQ FT

30 GRAB SAMPLES

ENG 375/91

MORRISON KNUDSEN CORPORATION

Project: I 70/Vasquez Blvd	Contract No. 4994	Sheet	
Feature: [illegible]	Designed [illegible]	File No.	
Item	Checked	Date 11-3-99	
		Date	



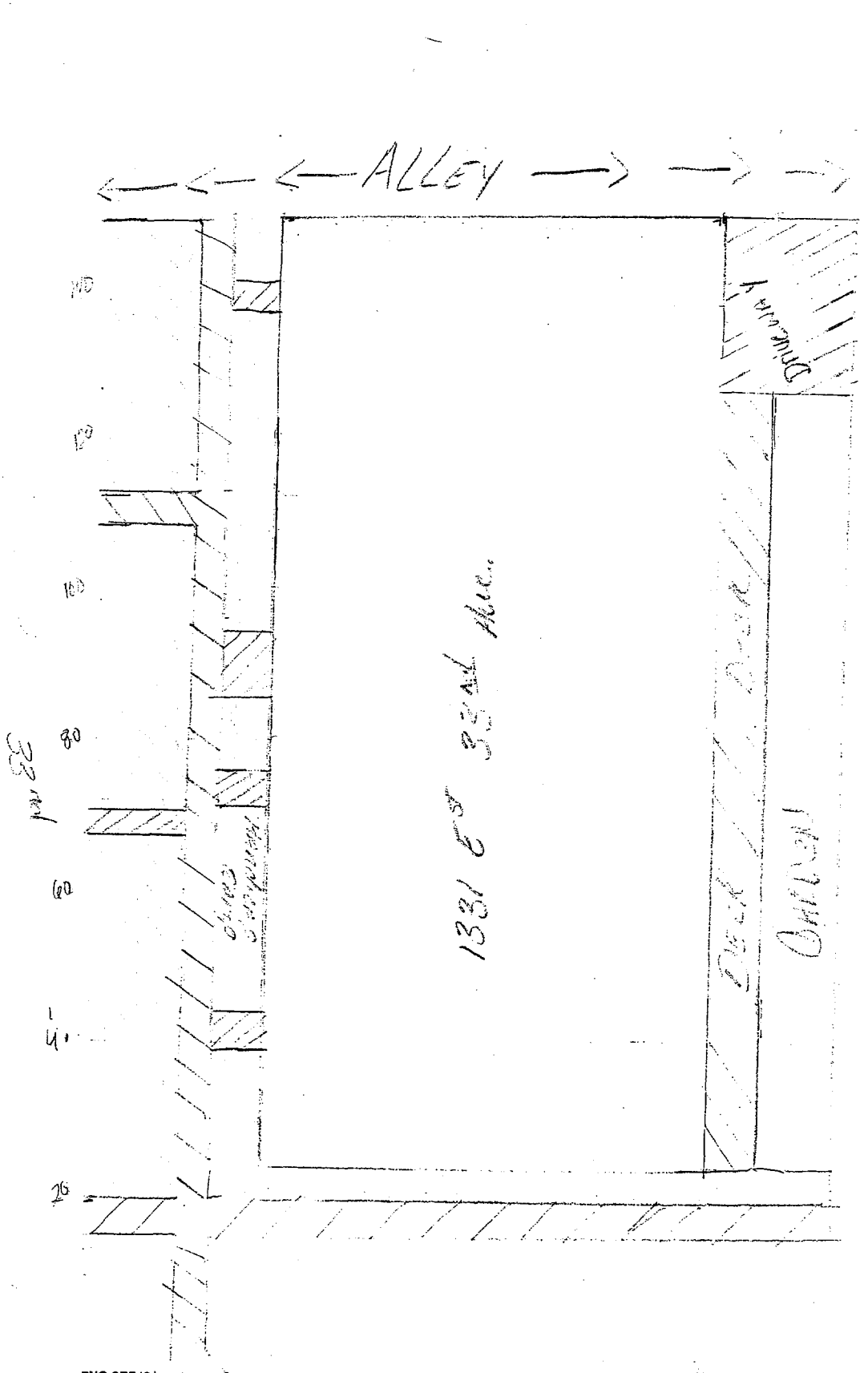
5250
1045
980
130
700
500
8600 SQ FT

30 GRAB SAMPLES

(IF SOIL IS ACCESSIBLE BENEATH DEBRIS)

MORRISON KNUDSEN CORPORATION

Project I-81 I-70 Contract No. 4994 Sheet
Feature Family Star Montessori Designed VAL Date 11/3/99 File No.
Item Checked Date



1050
675
224
1200
50
50
200
100
350
3899 SQ FT

30 GRAB SAMPLES

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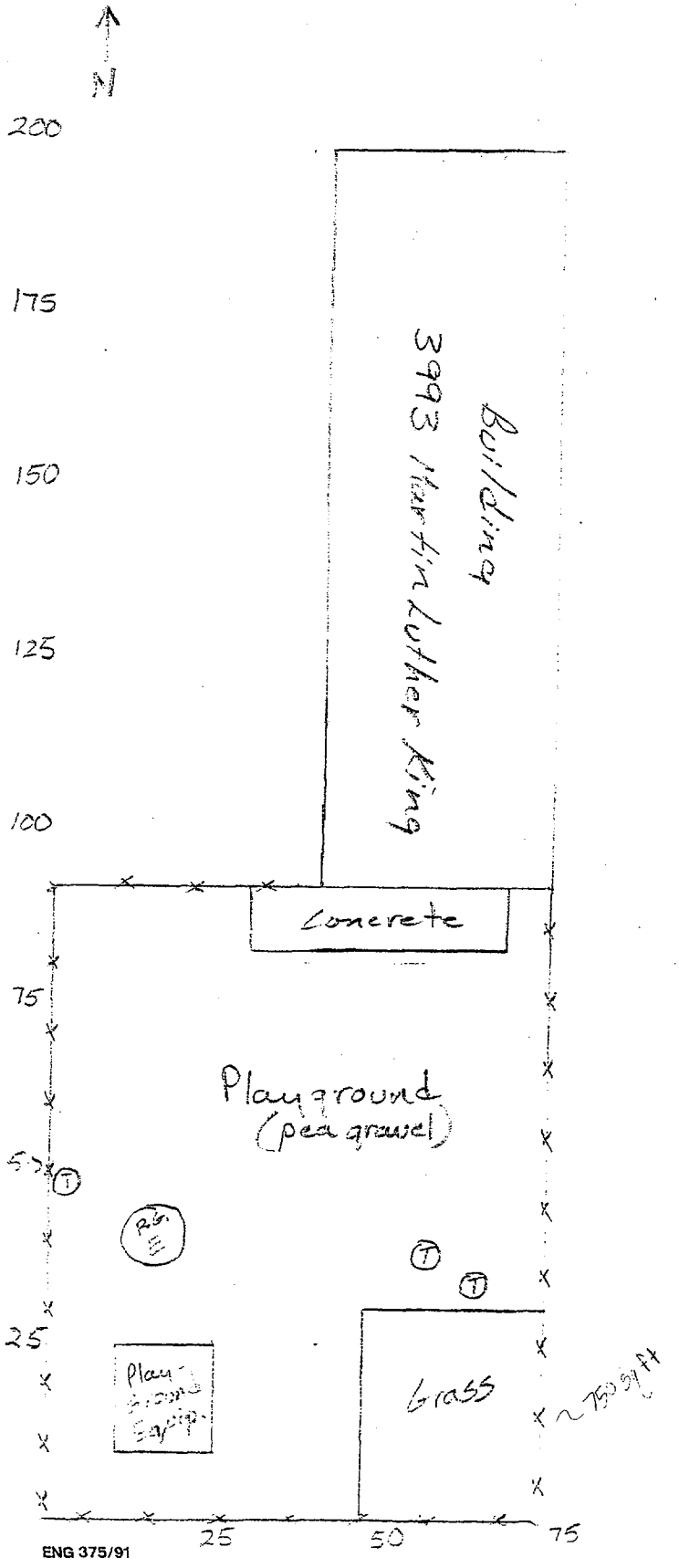
Project I-70 / Vasquez Blvd. Contract No. 1001 Sheet 4 of 11
Feature Garfield Montessori School Designed KBL File No.
Item Checked Date 11-1-90 Date



750 SQ FT

15 GRAB SAMPLES

T = Tree

East 181' to Colorado Blvd.

ENG 375/91

South 157' to Martin Luther King Blvd.

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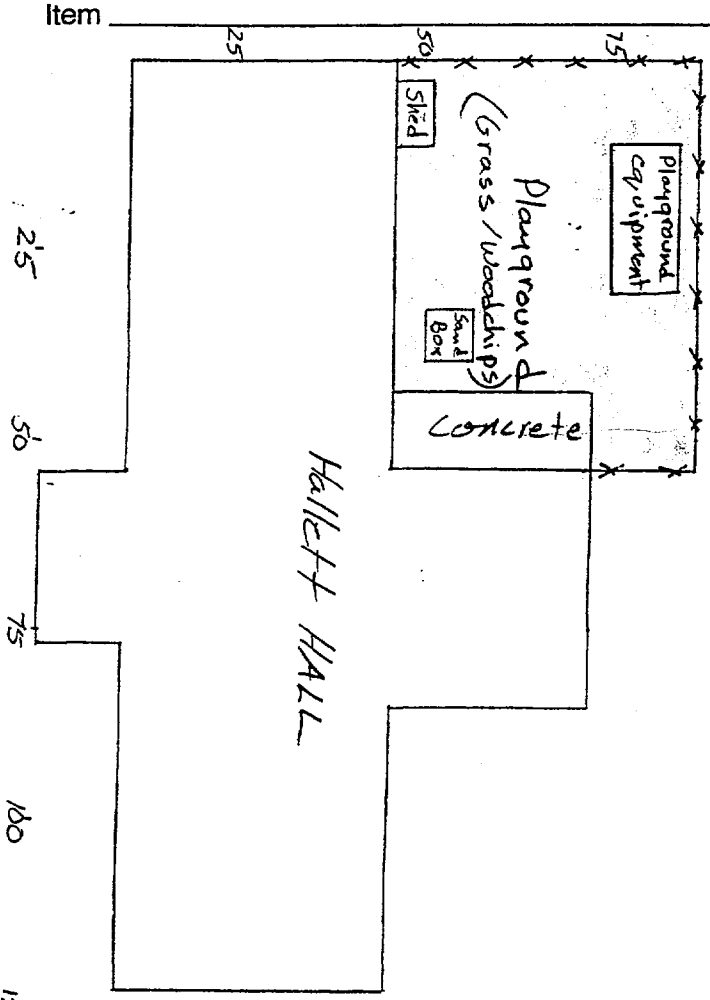
Sheet 1 of 4

Project I-70/Vasquez Blvd. Contract No. 4994 File No.

Feature Hallett Hall Designed [illegible] Date 11-1-99

Item Checked Date



South 389' to Martin Luther King Blvd.

1500 - 100 -

N →

~1300 sq ft

15 GRAB SAMPLES

(IF GRASS UNDER WOODCHIPS IS ACCESSIBLE)

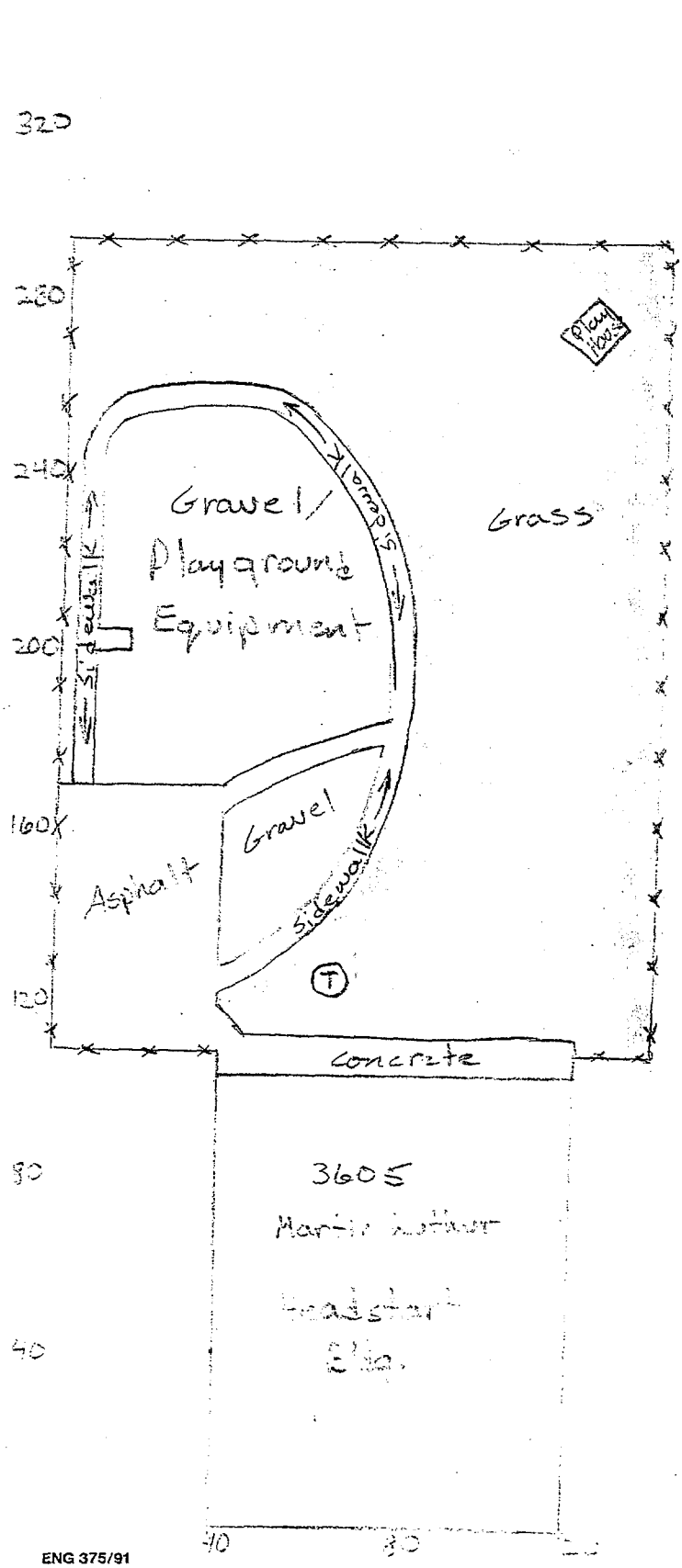
MORRISON KNUDSEN CORPORATION

Sheet 2 of 4

Project I-710 / Vasquez Blvd. Contract No. 4704 File No.

Feature 3605 Martin Luther - Headstart Bldg. Designed KAL Date 11-1-90

Item Checked Date



> 1500 sq ft

30 GRAB SAMPLES

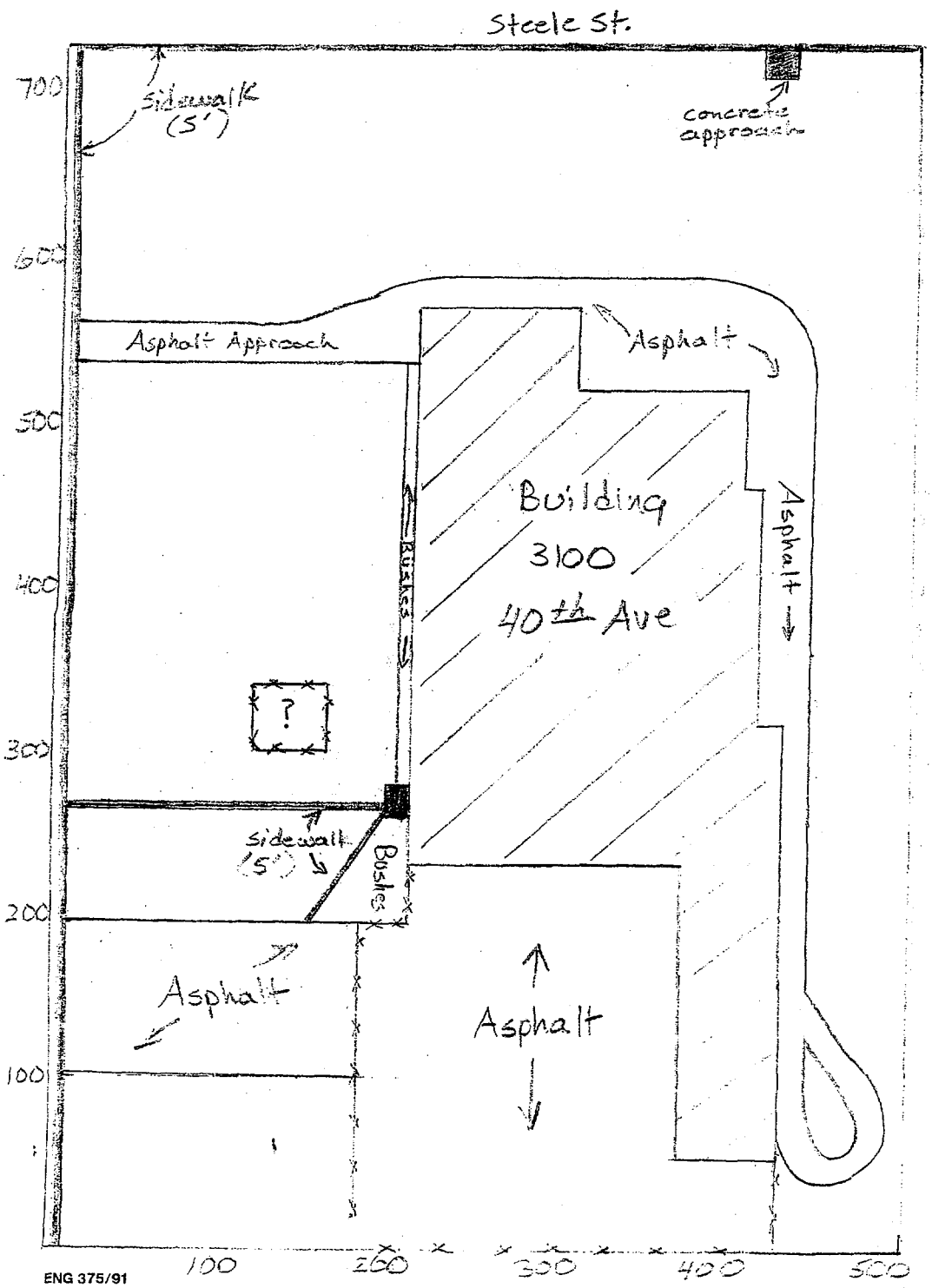
T = Tree

ENG 375/91

MORRISON KNUDSEN CORPORATION

Project I-70 / Vasquez Blvd. Contract No. 1094 Sheet ____ File No. ____
Feature 3100 40th Ave - New School Site Designed ____ Date 11-3-90
Item ____ Checked ____ Date ____

300 ← N



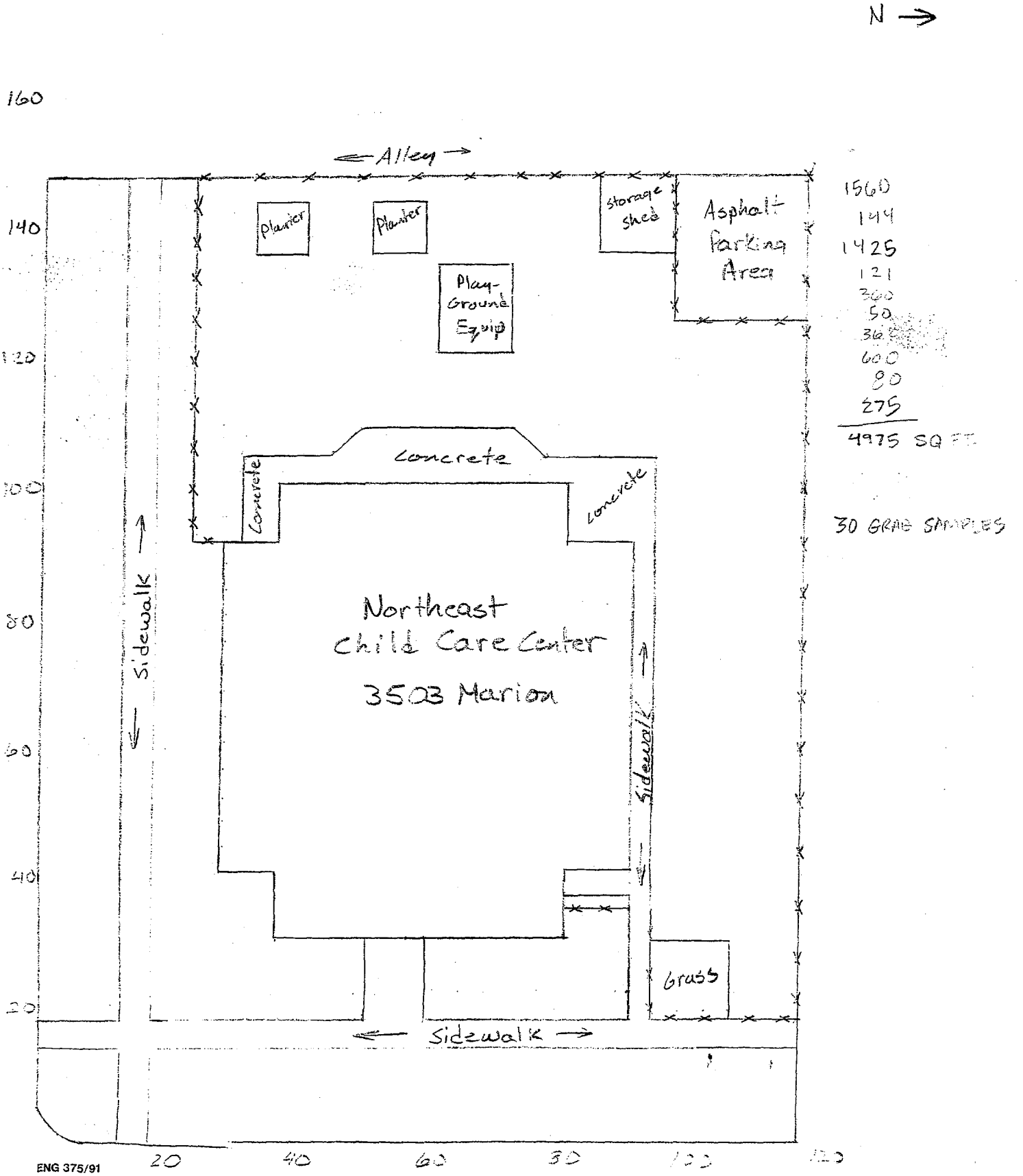
15000
65000
62500
27500
170000 SQ FT

30 GRAB SAMPLES

ENG 375/91

MORRISON KNUDSEN CORPORATION

Project I-70 / Vasquez Blvd. Contract No. 4994 Sheet ____
Feature Northeast Montessori Child Care Designed ____ Date 11-3-99 File No. ____
Item ____ Checked ____ Date 11-3-99



1560
144
1425
121
300
50
36
600
90
275
4975 SQ FT

30 GRAB SAMPLES

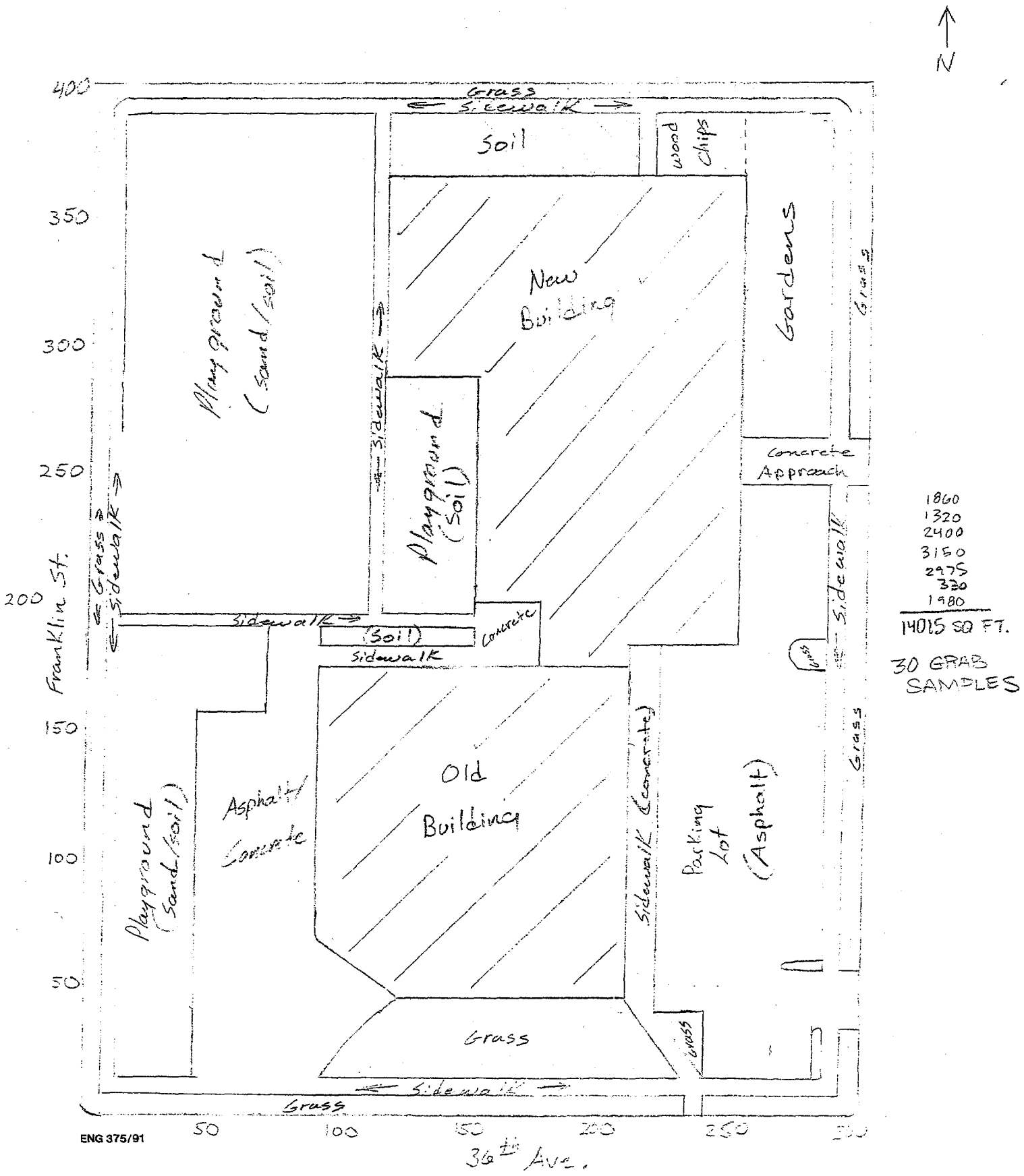
ENG 375/91

MORRISON KNUDSEN CORPORATION

Project FTO Vasquez Blvd
Feature Wyatt-Edison School
Item

Contract No. 4991
Designed JKH
Checked KBW

Sheet
File No.
Date
Date 11-1-90



1860
1320
2400
3150
2975
330
1980
14015 SQ FT.

30 GRAB SAMPLES

ENG 375/91

Attachment 2

Date: November 15, 1999 (Rev. # 0) SOP No. ISSI-VBI70- 12

Title: SURFACE SOIL SAMPLING AT SCHOOLS AND PARKS

APPROVALS:

Author ISSI Consulting Group, Inc. Date: November 15, 1999

SYNOPSIS: A standardized method for collection of surface soil samples at schools, parks, and commercial properties is described. Protocols for sample collection, and sample handling are provided.

Received by QA Unit:

REVIEWS:

TEAM MEMBER	SIGNATURE/TITLE	DATE
EPA Region 8	Robert Locke / RPM	11/17/99
ISSI Consulting Group, Inc.	W S Bratton	11/17/99

Revision Date	Reason for Revision

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a standardized method for collecting surface soil samples to be used by employees of USEPA Region 8 contractors/subcontractors supporting USEPA Region 8 projects and tasks. This SOP describes the equipment and operations used for sampling surface soils in areas which will produce data that can be used to support risk evaluations. Site-specific deviations from the procedures outlined in this document must be approved by the USEPA Region 8 Remedial Project Manager, or Regional Toxicologist prior to initiation of the sampling activity.

2.0 RESPONSIBILITIES

The Field Project Leader (FPL) may be an USEPA employee or contractor who is responsible for overseeing the surface soil sampling activities. The FPL is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by this SOP and the Project Plan. It is the responsibility of the FPL to communicate with the Field Personnel regarding specific collection objectives and anticipated situations that require any deviation from the Project Plan. It is also the responsibility of the FPL to communicate the need for any deviations from the Project Plan with the appropriate USEPA Region 8 personnel (Remedial Project Manager, or Regional Toxicologist).

Field personnel performing surface soil sampling are responsible for adhering to the applicable tasks outlined in this procedure while collecting samples.

3.0 EQUIPMENT

- Soil augers - Various models of soil augers are acceptable and selection of the specific brand and make of tool will be recommended by the contractor implementing the field work (Morrison Knudsen Corporation). Augers are usually made of stainless steel, and should be capable of retrieving a cylindrical plug of soil 2 inches in diameter and 2 inches deep. In all cases the procedures recommended by the manufacturers should be followed with regard to use of the auger. Augers with disposable plastic sleeves may be employed to minimize the decontamination effort.

- Collection containers - plastic ziplock bags

- Trowels - for extruding the soil sample from the auger. May be plastic or stainless steel.

- Gloves - for personal protection and to prevent cross-contamination of samples. May be plastic or latex. Disposable, powderless.

- Field clothing and Personal Protective Equipment - as specified in the Health and Safety Plan.
- Field notebook -used to record progress of sampling effort and record any problems and field observations.
- Permanent marking pen - used to label sample containers.
- Three-ring binder book - to store necessary forms used to record and track samples collected at the VBI70 site. Binders will contain Data Collection Sheets, Site Diagrams, and sample labels for each day.
- Measuring tape or pocket ruler -used to measure the length of soil core in the soil coring device.
- Trash Bag - used to dispose gloves and wipes.

4.0 METHOD SUMMARY

Grab samples will be collected from the 0-2 inch soil horizon and placed into separate plastic ziplock bags. Each sample will be collected using a clean auger and trowel, and identified with a unique number ending with "-R", provided on the sample labels. One label is placed on the Surface Soil Collection Data Sheet for Schools and Parks (example provided in Attachment 1) and the other label is affixed to the zip-lock bag containing the sample. Sample labeling will occur as prescribed below:

- Place a pre-printed label ending with the "-R" onto the zip-lock bag (See Sample Identification and Tracking SOP# ISSI-VBI70-01)
- Place a pre-printed label ending with the "-R" onto the Surface Soil Data Collection Sheet for Schools and Parks
- Place all the ziplock bags for grab samples collected at each location (school or park) into a larger (gallon size or larger) zip-lock bag that has been marked on the outside of the bag with the area identification number (or name of the park or school) with permanent marker.

4.1 Soil Sample Location Identification

The surficial sampling locations within a park or school will be based on the area of each location, as determined by a sampling grid design. For this portion of the Phase 3 field sampling, maps and site sketches for all of the schools and parks to be sampled have been prepared. The number of grab samples to be collected at each of these locations has been recorded on the site diagram for each location. Copies of these site diagrams are provided in the Sampling and

Analysis Plan (SAP) for schools and parks. In areas less than or equal to approximately 1,500 square feet, a total of 15 grab samples will be collected. In areas greater than approximately 1,500 square feet, a total of 30 grab samples will be collected. In the event that additional locations are selected for surface soil sampling, the following procedure is provided for determining the number of grab samples that should be collected. Identification of individual grab sample locations will be performed using the following general steps.

The team leader (TL) for each sampling team will be trained in this procedure in order to ensure replicable sample location assignment. The following steps will be followed (in order) prior to any sample collection:

a. Measure each yard

b. Pace off each building or permanent obstruction

c. Identify major samplable areas

d. Determine the number of sample points in each location

e. Record sample locations

f. Mark sample locations

g. Collect the sample

4.1.1 Measure each location

Site diagrams for schools and parks that will be sampled as part of the Phase 3 field investigation have already been prepared, and are included in the SAP for schools and parks. The following procedure is provided as a description of the methods that were used to prepare these maps.

The TL will visit each sampling location to assign the sampling scheme. The TL will measure the property dimensions with a measuring tape, measuring wheel or laser measuring device (± 0.5 feet). Draw a sketch of the property and record property dimensions, north orientation, and adjacent streets and alleyways on the site diagram.

4.1.2 Pace off each building or permanent obstruction

Schools and parks that will be included in the Phase 3 field investigation have already been measured, and the site diagrams are included in the SAP for schools and parks. The following procedure describes the methods that were used to prepare those maps.

The TL will then pace off the major permanent structures of the residence (e.g., dimensions of the property boundary, house, garage, driveway, etc.) and prepare a site diagram to approximate scale (± 3 feet on each measurement). The goal is not have a drawing to scale, but instead to have an estimate of the total samplable area at each location. The total samplable area is defined as any area on the property that is free of permanent obstructions. Temporary obstructions such as automobiles or trailers parked on unpaved property locations, picnic tables, or plastic or other materials covering the property are not permanent structures and will be considered "samplable". Therefore, areas that could be used in the future if the temporary obstructions were removed, should be identified on the field diagram and must be considered in sample location identification. Figure 1 and Figure 2 provide examples of a typical residence at the VBI70 site that has been drawn on a grid.

4.1.3 Determine the number of sample points at each location

For each location, the samplable area will be divided into rectangular subareas, using natural boundaries such as buildings, sandboxes, or sidewalk as division markers (See Figure 2). For convenience, it is recommended that the number of subareas identified is minimized. Draw the subareas on the site diagram sheet. Count the number of squares in each subarea and record this information on the field data sheet. Add the total number of squares contained in each of the subareas, and record in the appropriate space on the surface soil data sheet. Divide this number by the number of grab samples collected at that property, and record in the appropriate space on the data sheet (Attachment 1).

4.1.4 Record sample locations

Before placing marker flags at each location, mark their planned location on the site diagram. Marking flag locations on the site diagram before actually placing them will give the TL a chance to check that sample locations are evenly distributed within each location, and that sample locations are documented and recorded. Because property sizes and obstacles present at each sampling location may vary significantly, actual grab sample locations will be identified using a diagram that will be drawn for each individual property sampled. If either permanent or temporary obstructions are present at the intended sampling locations, the sample point should be offset so that a surficial grab sample may be collected, then the actual sample location must be correctly documented on the field diagram. If the TL identifies an error in the sample location identification procedures that compromise the readability of the document, a new, revised diagram may be necessary. After recording all of the sample points, the TL should check the site diagram to make sure that sample locations are not clustered in any area (unless clustering is a result of offsetting sample locations due to obstructions). The TL should also verify that sample points are approximately equidistant throughout the property.

4.1.5 Mark sample locations

Starting at one corner of the property, stake sample locations so that there is an even distribution of flags at each location (Figure 2). As seen in Figure 2, the location of each marker flag should be approximately equidistant from the other flags. A sample location or flag may be reassigned if clustering is observed.

5.0 COLLECTION OF SOIL SAMPLES USING A SOIL AUGER

A new pair of plastic gloves are to be worn at each sample point.

Place the soil coring tool on the ground and position it vertically. Holding the tool handle with both hands, apply pressure sufficient to drive the tool approximately 2 inches into the ground while applying a slight twisting force to the coring tool. Remove the tool by pulling up on the handle while simultaneously applying a twisting force. If the sample was retrieved successfully, a plug of soil approximately two inches long should have been removed with the coring tool.

Hold the soil coring tool horizontally or place it on the ground. Using a clean spatula or knife, remove the soil collected at depth greater than two inches from the end of the sampling tool. Allow this soil to fall into the plastic bucket designated for excess soil material. Use a trowel to extrude the soil from the auger, pushing the two-inch soil plug from the coring tool so that it falls directly into the zip-lock bag.

Care should be taken to avoid tracking soil from one area to another. As samples are taken sequentially, care should also be taken not to contaminate an area yet to be sampled with the residue of the sample that is currently being taken. In general one should move in a single direction through the sampling area. If an area is known or suspected of having a higher concentration of metals, all other considerations being equal, it should be sampled last to prevent cross contamination.

Decontaminate equipment as described in Section 9.0.

6.0 SAMPLE CONTAINERS AND LABELING

Following the procedures outlined in Section 5.0, grab samples will be collected directly into zip lock bags and labeled in accord with the most recent version of the Sample Identification and Tracking SOP (# ISSI-VBI70-01). Each sample must have a sample identification number affixed to the zip-lock bag, and also attached to the Surface Soil Data Sheet for Schools and Parks.

7.0 SITE CLEAN-UP

Each hole must be backfilled with clean topsoil and tamped down lightly. If sod was removed to

obtain the soil sample, the hole should first be backfilled and then the grass plug be replaced by the field personnel.

Rinse water used for sample decontamination that is generated in the course of sample collection must be disposed of as specified in the SOP for Investigation Derived Waste Management (MK-VBI70-04). Wherever possible, sod and soil (not collected and retained as part of the grab sample) should be replaced in the same hole.

Throw all used wipes and gloves into the trash bags and take with you to dispose of at the field office.

8.0 FIELD QUALITY ASSURANCE/QUALITY CONTROL

Adherence to quality assurance/quality control (QA/QC) procedures is an important part of field sample collection. Field QA/QC procedures include documentation requirements and preparation of field QC samples.

8.1 Field Quality Control Samples

The following QC sample will be collected during surface soil sampling.

Field Duplicate: Field duplicate samples are co-located samples at a single grab sample location. These samples are submitted blind to the laboratory to test both the precision of the laboratory analysis and the precision of sample collection. Field duplicates are required to be collected at a frequency of 5% of all surface soil grab samples collected (1 field duplicate per 20 investigation samples collected).

8.2 Field documentation

A field notebook should be maintained by each individual or team that is collecting samples as described in the Project Plan. For each location (school or park), the following information should be collected.

h. date
i. time
j. personnel
k. weather conditions
l. a sketch of the sample location that is filled in with sample identification numbers as the samples are collected
m. locations of any samples that could not be acquired
n. descriptions of any deviations to the Project Plan and the reason for the deviation

Samples taken from soils with visible staining or other indications of non-homogeneous conditions should be noted. Use the maps provided by the FPL or draw a diagram that details each sample area (school or park). Sample locations and sample numbers should be identified on the diagram.

In addition, each field crew will maintain a three-ring binder book that has Surface Soil Data Sheets and sample labels needed for each day. At the end of the day, the field crew will submit these forms and check them in with the FPL at the time that the samples are checked in.

Field personnel will collect the proper type and quantity of quality control samples as prescribed in the Project Plan.

9.0 DECONTAMINATION

Because decontamination procedures are time consuming, having a quantity of sampling tools sufficient to require decontamination at a maximum of once per day is recommended. All sampling equipment must be decontaminated prior to reuse. Follow the procedures outlined in SOP No. MK-VBI70-07.

10.0 GLOSSARY

Project Plan - The written document that spells out the detailed site-specific procedures to be followed by the Project Leader and the Field Personnel.

Sample Point - The actual location at which the sample is taken. The dimensions of a sample Point are 2" in diameter and 2" deep.

11.0 REFERENCES

USEPA, 1995. Residential Sampling for Lead: Protocols for Dust and Soil Sampling, Final *Report*, EPA 747-R-95-001, USEPA, March 1995, 38 p.

American Society for Testing and Materials, 1995. Standard Practice for Field Collection of Soil Samples for Lead Determination by Atomic Spectrometery Techniques, ASTM Designation: E 1727 - 95, October 1995, 3 p.

Color Chart(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

Figure 1 Proposed Grid Sampling Design for Surface Soil Collection at Schools and Parks

Step 1:

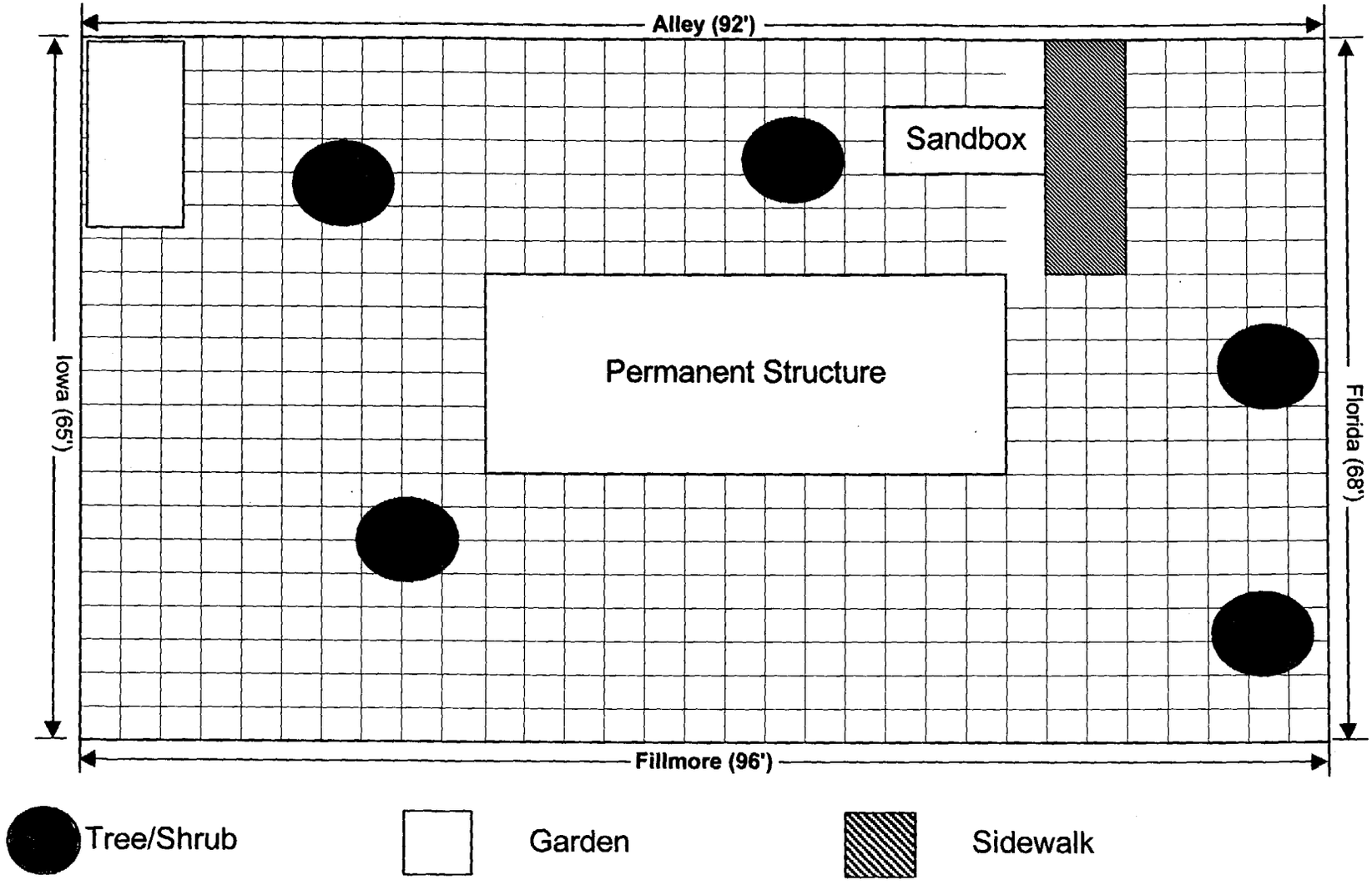
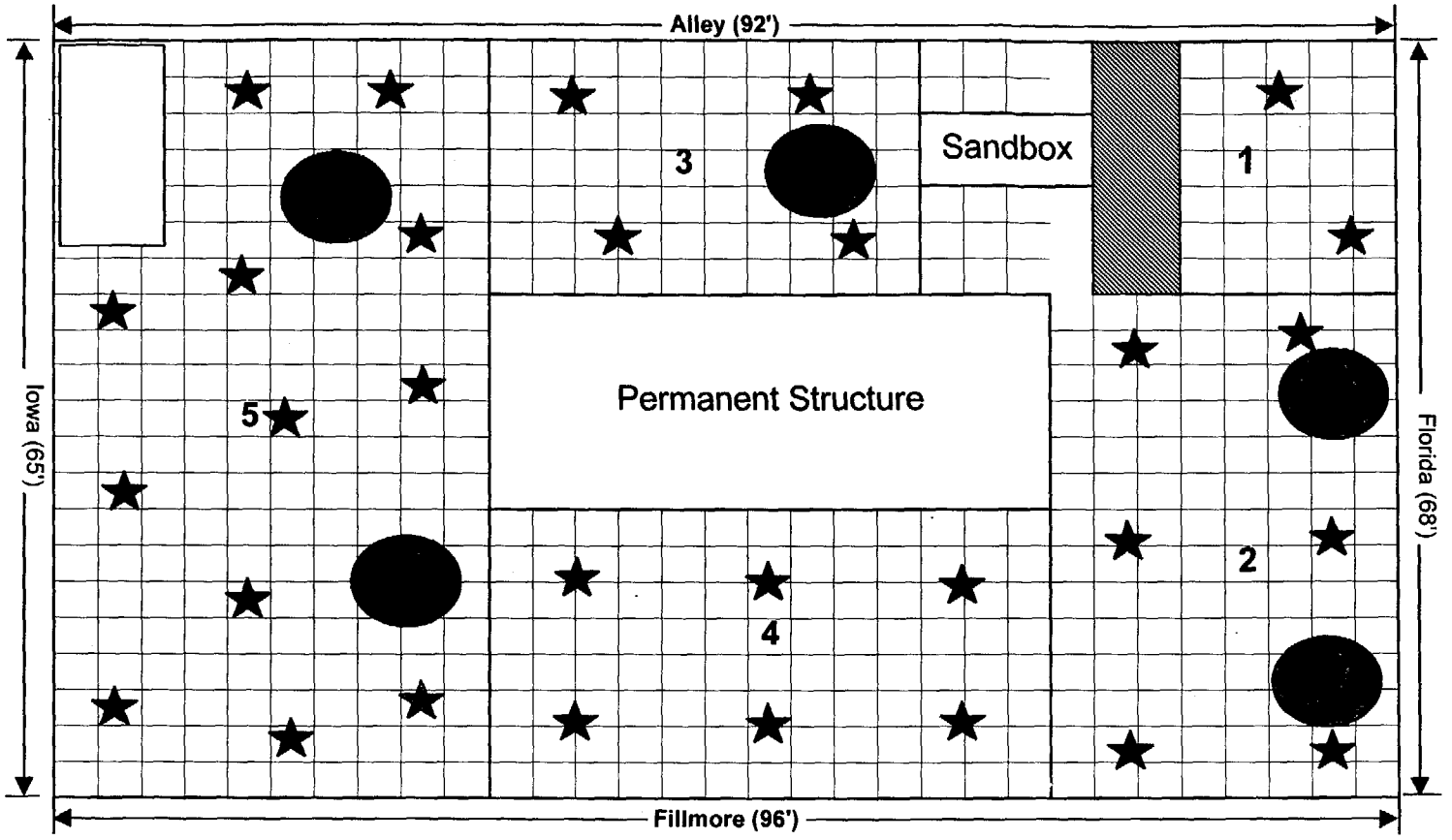


Figure 2 Proposed Grid Sampling Design for Surface Soil Collection at Schools and Parks

Step 2:



Tree/Shrub

Garden

Sidewalk

Sampling Locations

Sub Area	No. of Grids	No. of Flags
1	42	2
2	112	6
3	70	4
4	104	6
5	210	12
Total:	**538**	**Total: 30**

Divide by no. of Grab Samples (30): 17.9

No. of grab samples: 30

smlgrid.xls

ATTACHMENT 1

SURFACE SOIL COLLECTION DATA SHEET FOR SCHOOLS AND PARKS

PHASE: 3

MEDIUM: School or Park Soil

DATE: _____

DEPTH: 0-2"

SAMPLE COLLECTION METHOD: SOP-ISSI-VBI70-12

LOCATION NAME: _____

LOCATION ADDRESS: _____

SAMPLE TEAM ID: _____

INDEX	SAMPLE NO.	CLASS FS = Field Sample FD = Field Duplicate	SAMPLE TYPE	ORIGINAL SAMPLE NO.
1		FS FD	GRAB	
2		FS FD	GRAB	
3		FS FD	GRAB	
4		FS FD	GRAB	
5		FS FD	GRAB	
6		FS FD	GRAB	
7		FS FD	GRAB	

Name of School or Park: _____

INDEX	SAMPLE NO.	CLASS FS = Field Sample FD = Field Duplicate	SAMPLE TYPE	ORIGINAL SAMPLE NO.
8		FS FD	GRAB	
9		FS FD	GRAB	
10		FS FD	GRAB	
11		FS FD	GRAB	
12		FS FD	GRAB	
13		FS FD	GRAB	
14		FS FD	GRAB	
15		FS FD	GRAB	

Name of School or Park : _____

INDEX	SAMPLE NO.	CLASS FS = Field Sample FD = Field Duplicate	SAMPLE TYPE	ORIGINAL SAMPLE NO.
16		FS FD	GRAB	
17		FS FD	GRAB	
18		FS FD	GRAB	
19		FS FD	GRAB	
20		FS FD	GRAB	
21		FS FD	GRAB	
22		FS FD	GRAB	
23		FS FD	GRAB	

Name of School or park: _____

INDEX	SAMPLE NO.	CLASS FS = Field Sample FD = Field Duplicate	SAMPLE TYPE	ORIGINAL SAMPLE NO.
24		FS FD	GRAB	
25		FS FD	GRAB	
26		FS FD	GRAB	
27		FS FD	GRAB	
28		FS FD	GRAB	
29		FS FD	GRAB	
30		FS FD	GRAB	

Name of School or Park: _____

INDEX	SAMPLE NO.	CLASS FS = Field Sample FD = Field Duplicate	SAMPLE TYPE	ORIGINAL SAMPLE NO.
31		FS FD	GRAB	
32		FS FD	GRAB	
33		FS FD	GRAB	

Samples Collected by: _____ **Signature** _____ **Date**

Logbook Page Reviewed by: _____ **Signature** _____ **Date**